

# MATERIAL SAFETY DATA SHEET

## 1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology  
Standard Reference Materials Program  
100 Bureau Drive, Stop 2320  
Gaithersburg, Maryland 20899-2320

SRM Number: 4972  
MSDS Number: 4972  
SRM Name: Radon-222 Emanation  
Standard

Date of Issue: 10 April 2006

MSDS Coordinator: Mario Cellarosi  
Telephone: 301-975-6776  
FAX: 301-926-4751  
E-mail: SRMMSDS@nist.gov

Emergency Telephone ChemTrec:  
1-800-424-9300 (North America)  
+1-703-527-3887 (International)

**Description:** This Standard Reference Material (SRM) consists of a heat-sealed polyethylene capsule that contains a solution of radioactive radium-226 chloride (and its radioactive decay products), non-radioactive barium chloride and hydrochloric acid dissolved in approximately 0.2 mL of distilled water. The resulting solution is 1.0 M hydrochloric acid. The SRM is intended for the calibration of radon-222 measurement systems.

**Substance:** Radium-226 Chloride and Barium Chloride in 1.0 M Hydrochloric Acid

**Other Designations:** **Radium-226 Chloride** and **Barium Chloride** (barium dichloride) in **Hydrochloric Acid** (aqueous hydrochloric acid; hydrogen chloride; muriatic acid).

**Radiological Hazard:** The SRM capsule contains radium-226 with an activity of approximately 50 Bq. Radium-226 decays by alpha-particle emission. The progeny of radium-226 inside the capsule have a total activity of approximately 150 Bq and decay by alpha- and beta-particle emission. None of the alpha or beta particles escape from the SRM capsule. During the decay process, X-rays and gamma rays with energies from 11 keV to 2.5 MeV are also emitted. Some of these photons escape from the SRM capsule, but do not represent a radiation hazard. The capsule is shipped and is intended to be stored in a closed screw-cap vial. Gaseous radon-222 will escape from the capsule through diffusion so the capsule, when not in use, should be kept in the vial. None of alpha or beta particles from decay of radon-222 and its progeny escape from the closed glass vial. The total activity of radon-222 and its progeny inside the vial is approximately 220 Bq. High energy gamma rays may escape, but do not represent a radiation hazard. **The SRM should be used only by persons qualified to handle radioactive material. The hazard information supplied in this MSDS is for the Chemical Hazard Only! For the hazard documentation concerning the radioactive material, refer to the SRM Certificate.**

## 2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

<b>Component:</b>	<b>Hydrochloric Acid</b>
<b>CAS Number:</b>	7647-01-0
<b>EC Number (EINECS):</b>	231-595-7
<b>SRM Nominal Concentration:</b>	1 M
<b>EC Classification:</b>	T, C
<b>EC Risk (R):</b>	23, 35
<b>EC Safety (S):</b>	1, 2, 9, 26, 36, 37, 39, 45

**NOTE:** The total concentration of BaCl<sub>2</sub> in this material is less than 1 % of the composition of the mixture which is below the reportable limit required by OSHA according to 29 CFR 1910.1200 (g)(2)(i)(C)(1) for MSDS information of a health hazard. BaCl<sub>2</sub> is not listed in the National Toxicology Program (NTP) Annual Report on Carcinogens nor has it been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs, or by OSHA.

---

### 3. HAZARDS IDENTIFICATION

---

<b>Hydrochloric Acid</b>		
<b>NFPA Ratings (Scale 0–4):</b>	Health = 3	Fire = 0      Reactivity = 0
<b>Major Health Hazards:</b>	Respiratory tract burns. Skin burns. Eye burns. Mucous membrane burns.	
<b>Potential Health Effects</b>		
<b>Inhalation:</b>	Inhalation of fumes may cause irritation and burning of the nose, throat, and upper respiratory tract, coughing and choking.	
<b>Skin Contact:</b>	Skin contact may cause severe irritation, inflammation, and chemical burns.	
<b>Eye Contact:</b>	Vapors are irritating and may cause damage to the eyes. Eye contact may cause severe irritation, conjunctivitis, corneal necrosis, and burns with impairment or permanent loss of vision.	
<b>Ingestion:</b>	Ingestion can cause pain and burns of the mouth, throat, esophagus, and stomach. May also cause nausea, vomiting, diarrhea, chills, shock, and intense thirst. Perforation of the intestinal tract and circulatory collapse may occur. Death may occur due to esophageal or gastric necrosis.	
<b>Listed as a Carcinogen/ Potential Carcinogen:</b>	Yes    No	
	<input checked="" type="checkbox"/>	In the National Toxicology Program (NTP) Report on Carcinogens.
	<input checked="" type="checkbox"/>	In the International Agency for Research on Cancer (IARC)
	<input checked="" type="checkbox"/>	Monographs.
		By the Occupational Safety and Health Administration (OSHA).

---

### 4. FIRST AID MEASURES

---

<b>Hydrochloric Acid</b>	
<b>Skin Contact:</b>	Rinse affected area with copious amounts of water for at least 15 minutes while removing contaminated clothing followed by washing the area with soap and water. Obtain medical assistance if necessary.
<b>Eye Contact:</b>	Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance immediately.
<b>Inhalation:</b>	If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing by qualified personnel. Get medical attention if necessary.
<b>Ingestion:</b>	If ingestion occurs, contact poison control center or physician immediately. <b>DO NOT INDUCE VOMITING.</b> Give large quantities of water or milk. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head lower than hips to prevent aspiration. If person is unconscious, turn head to side. Obtain immediate medical assistance.

---

### 5. FIRE FIGHTING MEASURES

---

<b>Fire and Explosion Hazards:</b>	Hydrochloric acid is not considered a fire hazard. May react with metals or heat to release flammable hydrogen gas.
<b>Extinguishing Media:</b>	Use extinguishing agents appropriate for surrounding fire.
<b>Fire Fighting:</b>	<b>DO NOT</b> touch spilled material. Move container from fire area if it can be done without risk. Do not get water directly on material. Avoid inhalation of material or combustion by-products.
<b>Flash Point (°C):</b>	Not applicable.
<b>Method Used:</b>	Not applicable.
<b>Autoignition Temp. (°C):</b>	Not applicable.

**Flammability Limits in Air****UPPER (Volume %):** Not applicable.**LOWER (Volume %):** Not applicable.

---

**6. ACCIDENTAL RELEASE MEASURES**

---

**Occupational Release:** **DO NOT** touch spilled material. Notify safety personnel of spill. Spills should be handled according to radioactive spill procedures. In addition to the radioactive material, the material contains a strong acid and is corrosive.

**Disposal:** Refer to Section 13, "Disposal Considerations".

---

**7. HANDLING AND STORAGE**

---

**Storage:** Store capsule in a closed screw-cap vial. Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances. Store in a well-ventilated area.

**Safe Handling Precautions:** See Section 8, "Exposure Controls and Personal Protection" and the Certificate for SRM 4971.

---

**8. EXPOSURE CONTROLS AND PERSONAL PROTECTION**

---

**Exposure Limits:** **Hydrochloric Acid**  
OSHA (PEL): 7 mg/m<sup>3</sup> (5 ppm) ceiling  
ACGIH: 2 ppm ceiling  
NIOSH: 7 mg/m<sup>3</sup> (5 ppm) recommended ceiling  
OES UK: 2 mg/m<sup>3</sup> (1 ppm) TWA (gas) (mist)  
OES UK: 8 mg/m<sup>3</sup> (5 ppm) STEL (gas) (mist)

**Ventilation:** Use a local exhaust ventilation system. Ensure compliance with applicable exposure limits.

**Eye Protection:** Wear safety goggles. An eye wash station should be readily available near areas of use.

**Personal Protection:** Wear appropriate protective clothing and disposable chemically resistant gloves to prevent skin exposure.

---

**9. PHYSICAL AND CHEMICAL PROPERTIES**

---

**Component:** **Hydrochloric Acid**

**Appearance and Odor:** Colorless, liquid. Pungent, irritating odor.

**Relative Molecular Weight:** 36.5 g/mol

**Molecular Formula:** HCl

**Evaporation Rate**  
(for HCl solutions 0.02 N to 2 N): > 1 (ether = 1)

**Density (1 M HCl):** 1.0 g/cm<sup>3</sup>

**Water Solubility:** Soluble.

---

**10. STABILITY AND REACTIVITY**

---

**Stability:**   X   Stable        Unstable

Stable at normal temperature and pressure.

**Conditions to Avoid:** Avoid heat, flames, sparks and other sources of ignition. May ignite on contact with combustible materials. May react with evolution of heat on contact with water.

**Incompatible Materials:** Hydrochloric acid is incompatible with cyanides, metals, amines, bases, metal carbide, oxidizing materials, acids, halo carbons, combustible materials, halogens, and metal salts.

**Fire/Explosion Information:** See Section 5, "Fire Fighting Measures".

**Hazardous Decomposition:** Acid halides.

**Hazardous Polymerization:** \_\_\_\_\_ Will Occur                        X   Will Not Occur

---

## 11. TOXICOLOGICAL INFORMATION

---

**Route of Entry:**          X   Inhalation                        X   Skin                        X   Ingestion

**Toxicity Data:** Man, Oral LD<sub>50</sub>: 2 857 µg/kg  
Woman, Oral LD<sub>50</sub>: 420 µl/kg  
Human, Inhalation LC<sub>50</sub>: 1 300 ppm/30 min  
Human, Inhalation LC<sub>50</sub>: 3 000 ppm/5 min  
Rat, Inhalation LC<sub>50</sub>: 3 124 ppm/1 h  
Investigated as a mutagen and reproductive inhibitor.

**Health Effects  
(Acute and Chronic):** See Section 3: "Hazards Identification" for potential health effects.

---

## 12. ECOLOGICAL INFORMATION

---

**Ecotoxicity Data**

**Fish Toxicity:** Fathead minnow (Pimephales promelas) LC<sub>50</sub> (mortality): 21 900 µg/L (96 h)  
**Invertebrate Toxicity:** Water flea (Daphnia magna) EC<sub>50</sub> (immobilization): 560 µg/L (48 h)  
**Algal Toxicity:** Green algae (Chlorella pyrenoidosa) EC<sub>50</sub> (population size reduction):  
800 µg/L (1 600 weeks)  
**Phytotoxicity:** Water-hyacinth (Eichhornia crassipes) (residue): 1 000 µg/L  
(4 weeks to 48 weeks)

---

## 13. DISPOSAL CONSIDERATIONS

---

**Waste Disposal:** Dispose in accordance with all applicable federal, state, and local regulations for radioactive materials. Hydrochloric acid is subject to disposal regulations U.S. EPA 40 CFR 262, Hazardous Waste Number D002.

---

## 14. TRANSPORTATION INFORMATION

---

**SRM 4972:** Radon-222 Radioactivity Standard (0.2 mL)  
**U.S. DOT and IATA:** Radioactive Material, excepted package, limited quantity of material, UN2910; Hazard Class 7; Packing Group III; Sub Risk: Hydrochloric Acid, Dangerous Goods in excepted quantities (0.2 mL).

---

## 15. REGULATORY INFORMATION

---

**U.S. Regulations:** CERCLA Sections 102a/103 (40 CFR 302.4):  
Hydrochloric Acid: RQ 5 000 lbs (liquid)  
SARA Title III Section 302 (40 CFR 355.30):  
Hydrochloric Acid: TPQ 500 lbs (gas)  
SARA Title III Section 304 (40 CFR 355.40):  
Hydrochloric Acid: RQ 5 000 lbs (gas)  
SARA Title III Section 313 (40 CFR 372.65):  
Hydrochloric Acid: except non-aerosol forms  
OSHA Process Safety (29 CFR 1910.119):  
Hydrochloric Acid: TQ 500 lbs (gas)  
California Proposition 65: Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE: Yes.

CHRONIC: No.

FIRE: No.

REACTIVE: No.

SUDDEN RELEASE: No.

**CANADIAN Regulations:** WHMIS Classification: Not determined.

**EUROPEAN Regulations:** EC Classification:

T Toxic

C Corrosive

Danger/Hazard Symbol:

T Toxic

EC Risk and Safety Phrases:

R 23 Toxic by inhalation.

R 35 Causes severe burns.

S1/2 Keep locked up and out of reach of children.

S 9 Keep container in a well-ventilated place.

S 26 In case of contact with eyes rinse immediately with plenty of water and seek medical advice.

S 36/37/39 Wear suitable protective clothing, gloves, and eye/face protection.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

**National Inventory Status**

**U.S. Inventory (TSCA):** Hydrochloric Acid: Listed on inventory.

**TSCA 12 (b)**

**Export Notification:** Not listed.

---

**16. OTHER INFORMATION**

---

**Sources:** MDL Information Systems, Inc., MSDS *Hydrochloric Acid* 15 September 2005.

**Disclaimer:** Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.